

providing a semiconductor film on an insulating surface;
providing at least part of the semiconductor film with a
catalyst metal-containing material;

crystallizing said semiconductor film in a way that
causes said catalyst metal to diffuse through the semiconductor
film and function to promote a crystallization of a material of the
semiconductor film;

forming a gettering layer in contact with said
semiconductor film after the crystallization, said gettering layer
including phosphorous; and

thermally annealing said semiconductor film and said
gettering layer at a temperature not lower than 500°C in order to
getter the catalyst metal in said semiconductor film using said
gettering layer.

27. A method according to claim 26 wherein said
semiconductor device is a photoelectric conversion device.

28. A method according to claim 26 wherein said
thermally annealing is continued for 1-4 hours.

29. A method according to claim 26 wherein said
gettering layer comprises a phosphorous silicate glass containing
phosphorous at a concentration of 1 to 30 wt%.

Sub B1 Cont'd

Sub
F27

20680 Sub H17 7
33
step of remov



compris

0000

an insu

Sub doped w

forming a gettering layer in contact with said semiconductor film after the crystallization, said gettering layer including phosphorous; and

thermally annealing said semiconductor film and said gettering layer in order to getter the catalyst metal in said semiconductor film by said gettering layer.

35. A method according to claim 34 wherein said semiconductor device is a photoelectric conversion device.

36. A method according to claim 34 wherein said thermal annealing is continued for 1-4 hours.

37. A method according to claim 34 wherein said gettering layer comprises a phosphorous silicate glass containing phosphorous at a concentration of 1 to 30 wt%.

38. A method according to claim 34 wherein said gettering layer comprises silicon containing phosphorous at a concentration of 0.1 to 10 wt%.

39. A method according to claim 34 wherein said catalyst metal is selected from the group consisting of Ni, Fe, Co, Ru, Rh, Pd, Os, Ir, Pt, Cu and Au.

40. A method according to claim 34 further comprising a step of removing said gettering layer after the gettering.

41. A method according to claim 34 wherein said thermal annealing is conducted within a temperature from 500°C to 800°C.

42. A method of manufacturing a semiconductor device comprising:

providing a semiconductor film on an insulating surface;
providing a catalyst metal-containing material on at least part of said semiconductor film;

crystallizing said semiconductor film in a way that causes said catalyst metal to diffuse through the semiconductor film and function to promote a crystallization of said semiconductor film;

forming a gettering layer in contact with said semiconductor film after the crystallization, said gettering layer including phosphorous; and

thermally annealing said semiconductor film and said gettering layer in a nitrogen atmosphere in order to getter the catalyst metal contained in said semiconductor film by said gettering layer.

43. A method according to claim 42 wherein said semiconductor device is a photoelectric conversion device.

44. A method according to claim 42 wherein said thermal annealing is continued for 1-4 hours.

Sub
B3
contd

Sub
H1
semi

Sub
Flu
met.

[Handwritten signature]

Sub HI

SWB
B4

providing a catalyst metal-containing material on at least part of said semiconductor film;

crystallizing said semiconductor film by heating in a way that causes said metal to diffuse through the semiconductor film and to promote a crystallization thereof;

forming a gettering layer in contact with said semiconductor film after the crystallization;

thermally annealing said semiconductor film and said gettering layer at a temperature not lower than 500°C in order to getter the metal included in said semiconductor film by said gettering layer; and

forming a doped silicon film on said semiconductor film to form an intrinsic to doped junction.

52. A method according to claim 51 wherein said semiconductor device is a photoelectric conversion device.

53. A method according to claim 51 wherein said thermally annealing is continued for 1-4 hours.

54. A method according to claim 51 wherein said gettering layer comprises a phosphorous silicate glass containing phosphorous at a concentration of 1 to 30 wt%.

55. A method according to claim 51 wherein said gettering layer comprises silicon containing phosphorous at a concentration of 0.1 to 10 wt%.

Sub
F8
Contd

56. A method according to claim 51 wherein said thermal annealing is conducted at a temperature not higher than 800°C.

30

25

57. A method according to claim 51 wherein said catalyst metal is selected from the group consisting of Ni, Fe, Co, Ru, Rh, Pd, Os, Ir, Pt, Cu and Au.

Sub
F8

31

25

58. A method according to claim 51 further comprising a step of removing said gettering layer after the gettering.

Sub
F8
HI

59. A method of manufacturing a semiconductor device having a doped to intrinsic junction, said method comprising:

providing a substantially intrinsic semiconductor film on an insulating surface, said semiconductor film comprising amorphous silicon doped with boron at a concentration of 0.0001 - 0.1 atm%;

providing a catalyst metal at least partly on said semiconductor material;

crystallizing said semiconductor film by heating to cause said catalyst metal to diffuse through the semiconductor film and to promote a crystallization of said semiconductor film;

forming a gettering layer in contact with said semiconductor film after the crystallization thereof;

thermally annealing said semiconductor film and said gettering layer in order to getter the catalyst metal in said semiconductor film by said gettering layer; and

forming a doped to intrinsic junction using said intrinsic semiconductor film.

Sub
B5

37

60. A method according to claim 59 wherein said semiconductor device is a photoelectric conversion device.

61. A method according to claim 59 wherein said thermal annealing is continued for 1-4 hours.

62. A method according to claim 59 wherein said gettering layer comprises a phosphorous silicate glass containing phosphorous at a concentration of 1 to 30 wt%.

63. A method according to claim 59 wherein said gettering layer comprises silicon containing phosphorous at a concentration of 0.1 to 10 wt%.

37
64. A method according to claim 59 wherein said catalyst metal is selected from the group consisting of Ni, Fe, Co, Ru, Rh, Pd, Os, Ir, Pt, Cu and Au.

38
65. A method according to claim 59 further comprising a step of removing said gettering layer after the gettering.

66. A method according to claim 59 wherein said thermal annealing is conducted within a temperature from 500°C to 800°C.

67. A method of manufacturing a semiconductor device having a doped to intrinsic junction, said method comprising:

providing a semiconductor film comprising amorphous silicon formed on an insulating surface;

providing a catalyst metal-containing material at least partly on said semiconductor film;

crystallizing said semiconductor film by heating in a way that causes said catalyst metal to diffuse through the semiconductor film and function to promote the crystallization of said semiconductor film;

forming a gettering layer in contact with said semiconductor film after the crystallization; and

thermally annealing said semiconductor film and said gettering layer in a nitrogen atmosphere in order to getter the catalyst metal contained in said semiconductor film by said gettering layer; and

forming an intrinsic-to-doped junction on said semiconductor film.

68. A method according to claim 67 wherein said semiconductor device is a photoelectric conversion device.

69. A method according to claim 67 wherein said thermal annealing is continued for 1-4 hours.

70. A method according to claim 67 wherein said gettering layer comprises a phosphorous silicate glass containing phosphorous at a concentration of 1 to 30 wt%.

Sub
B6
Contd

71. A method according to claim 67 wherein said gettering layer comprises silicon containing phosphorous at a concentration of 0.1 to 10 wt%.

45

40

72. A method according to claim 67 wherein said semiconductor film comprises silicon.

Sub
F12

46

40

73. A method according to claim 67 wherein said catalyst metal is selected from the group consisting of Ni, Fe, Co, Ru, Rh, Pd, Os, Ir, Pt, Cu and Au.

Sub
H1

47

40

74. A method according to claim 67 further comprising a step of removing said gettering layer after the gettering.

75. A method according to claim 67 wherein said thermal annealing is conducted within a temperature from 500°C to 800°C.

76. A method of manufacturing a semiconductor device, comprising:

providing a semiconductor film on a substrate;

forming a catalyst metal-containing material, said catalyst being a material which facilitates crystallization of said semiconductor film to be formed more easily, but which when present in a final product of the semiconductor device will degrade operation of the semiconductor device;

crystallizing said semiconductor film in a way that causes said catalyst metal-containing material to diffuse into at

least a part of the semiconductor film, said catalyst metal containing material when so diffused functioning to facilitate said crystallization;

forming a further processing layer in contact with said semiconductor film, said further processing layer including a material that reduces a concentration of said catalyst metal-containing material; and

processing said semiconductor film and said further processing layer to reduce a concentration of said catalyst metal in said semiconductor film.

77. A method as in claim 76, wherein said further processing layer includes phosphorous.

78. A method as in claim 76, wherein said metal includes Nickel.

79. A method as in claim 76, wherein said catalyst material allows said crystallization to occur at a lower temperature.

80. A method as in claim 76, wherein said further processing layer is a gettering layer --